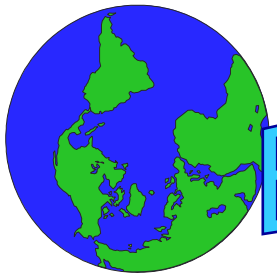
QUALITY MANAGEMENT/SYSTEMS AND SIX SIGMA

- EVOLUTION OF QUALITY MANAGEMENT/SYSTEMS
- MIL-Q-9858 (9 April 1959)
- 1960's and 1970's
- "IF JAPAN CAN, WHY CAN'T WE ?"
- 1987
- ADVANCED PRACTICES AND SYSTEMS
- SIX SIGMA AND ITS DIRECTIVES



EVOLUTION OF QUALITY MANAGEMENT/SYSTEMS

- Historical Perspective
  - * Craftsmanship
  - * Industrial Revolution
  - * Taylor System
- Inspection Departments
- Statistical Quality Control (SQC)
  - * Probability and Sample Inspection
  - * Shewhart Control Charts
- World War II and the Quality Movement

MIL-Q-9858 (9 April 1959)

1.2 **Contractual Intent**

This specification requires the establishment of a quality program by the contractor to assure compliance with the requirements of this contract. The program and procedures used to implement this specification shall be developed by the contractor.

- QUALITY PROGRAM MANAGEMENT
- FACILITIES AND STANDARDS
- CONTROL OF PURCHASES
- MANUFACTURING CONTROL

1960's and 1970's

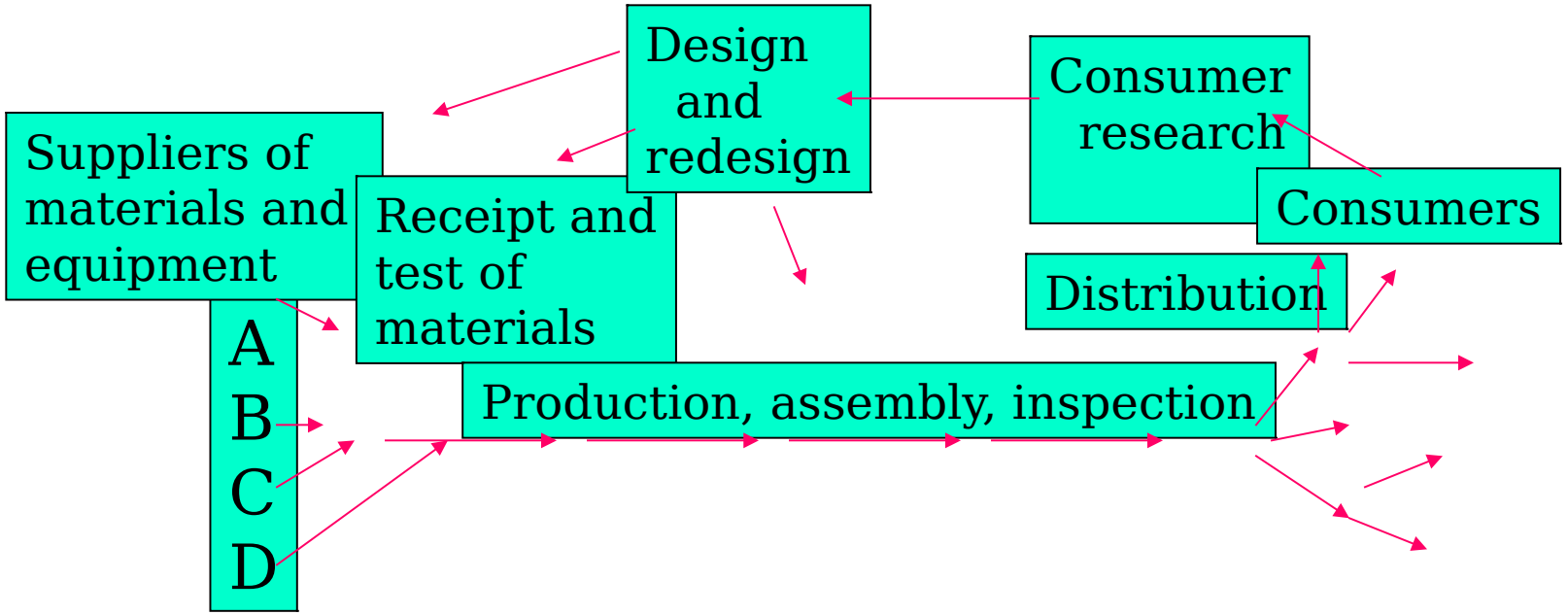
- Ship --- ship --- ship
- Quality Assurance
  * Quality Engineering
  * Quality Control
  * Metrology
  * Failure Analysis
- The good practices are dying

"If Japan Can, Why Can't We?"

- Chain Reaction: Quality, Productivity,
  Lower costs, Capture the Market

- U.S. losing: TV's, camera's, IC's, steel,
  textiles, shoes, automobiles, etc.

Quality Management System



The Earlly Gurru's

Deming
Juran
Crosby
Feigenbaum
Ishikawa

1987 - The Pivotal Year

- THE DOD AND TOTAL QUALITY MANAGEMENT (TQM)
- MALCOLM BALDRIGE NATIONAL QUALITY AWARD
- ISO 9000 INTERNATIONAL QUALITY STANDARDS

U. S. Chain Reaction

Quality

↓

Productivity

↓

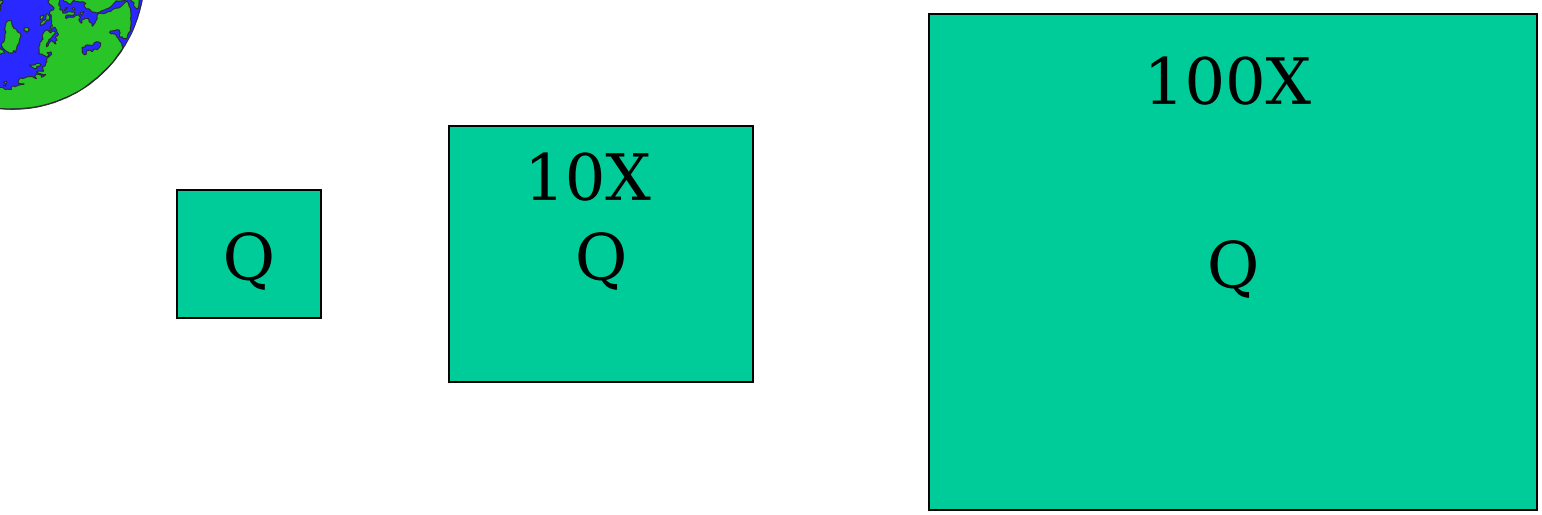
Lower Costs

↓

Stay in Business

- Deming’s 14 Points
- Crosby - “Quality is Free”
- Juran - Breakthrough Quality
- Xerox - Benchmarking
- Taguchi - Loss Function
- Motorola - Six sigma

THE EARLY DAYS OF MOTOROLA'S SIX SIGMA



1/1/87 1/1/89 1/1/91

Key Goals

- Increased Global Market Share
- Best-in-Class
  - * people
  - * marketing
  - * manufacturing
  - * technology
  - *product/service

KEY INITIATIVES

- Six Sigma
- Total Cycle Time Reduction
- Product and Manufacturing Leadership
- Profit Improvement
- Participative Management within, and Cooperation between Organizations

WHAT IS SIX SIGMA

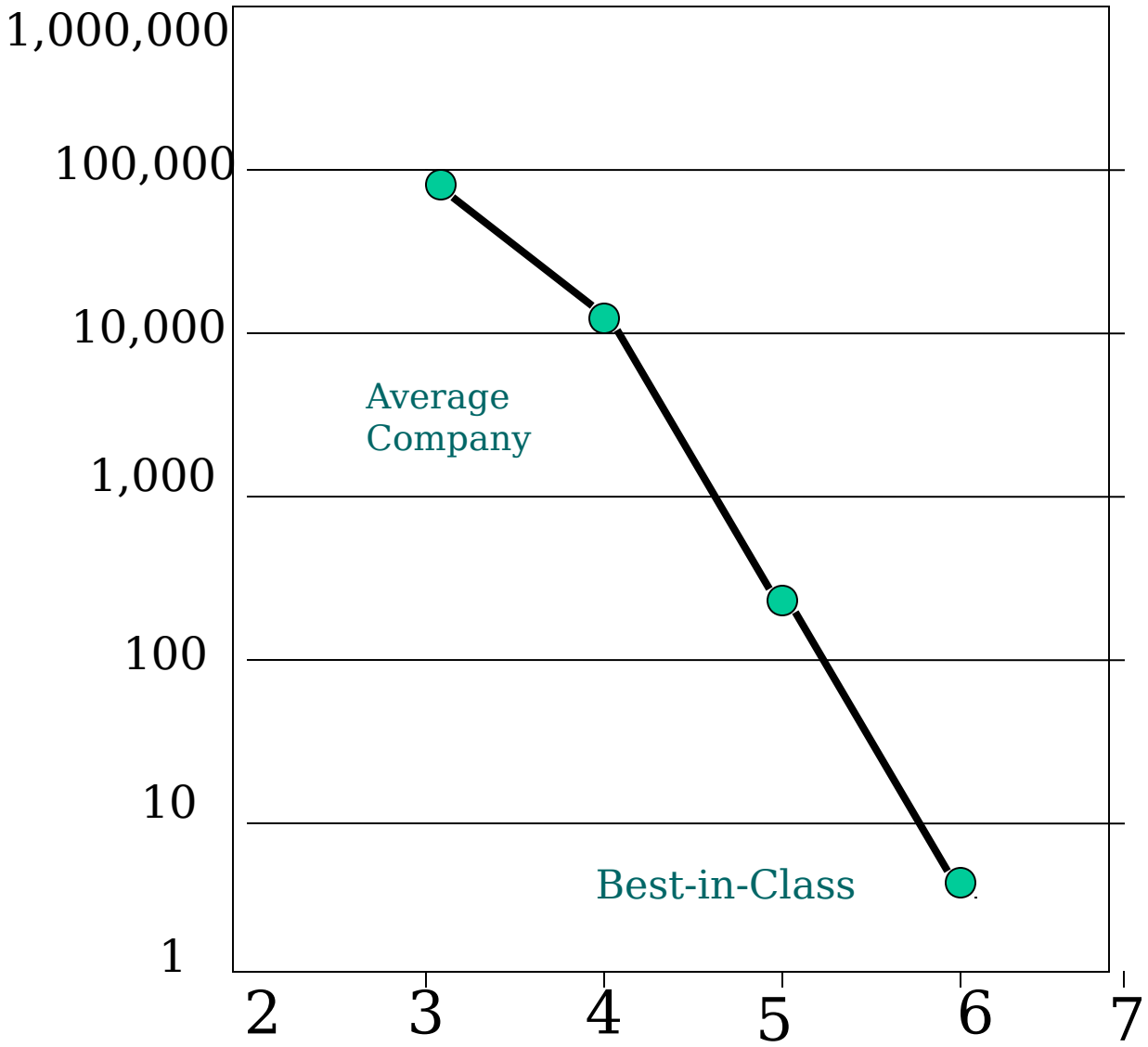
- Sigma is a measure of “goodness: the capability of a process to produce perfect work.
- A “defect” is any mistake that results in customer dissatisfaction.
- Sigma indicates how often defects are likely to occu
- The higher the sigma level, the lower the defect rate
- The lower the defect rate, the higher the quality.

WHY HAVE "SIGMA" AS A QUALITY MEASURE?

- Sigma allows comparison of products and services of varying complexity on an apples to apples basis.
- Also, it provides a common basis for benchmarking (competitors and non-competitors).
- The higher the sigma level, the better your operation is performing.
- Sigma measures how well you're doing in getting to zero defects.

OPPORTUNITIES FOR ERROR AT VARIOUS SIGMA LEVELS

Number of defects per million opportunities for error	Associated sigma level
66,810	3.0
22,750	3.5
6,210	4.0
1,350	4.5
233	5.0
32	5.5
3.4	6.0


1,000,000
100,000
10,000
1,000
100
10
1
Average
Company
Best-in-Class
2
3
4
5
6
7

SIX STEPS TO SIX SIGMA

Step1: Identify the product you create or the service you provide.

Step2: Identify the Customer(s) for your product or service and determine what they consider important.

Step3: Identify your needs (to provide product/service so that it satisfies the Customer).

Step4: Define the process for doing the work.

Step5: Mistake-proof the process and eliminate wasted effort.

Step6: Ensure continuous improvement by measuring, analyzing, and controlling the improved process.

POSSIBLE APPLICATIONS

Human Resources: reduce the number of requisitions unfilled after 30 days.

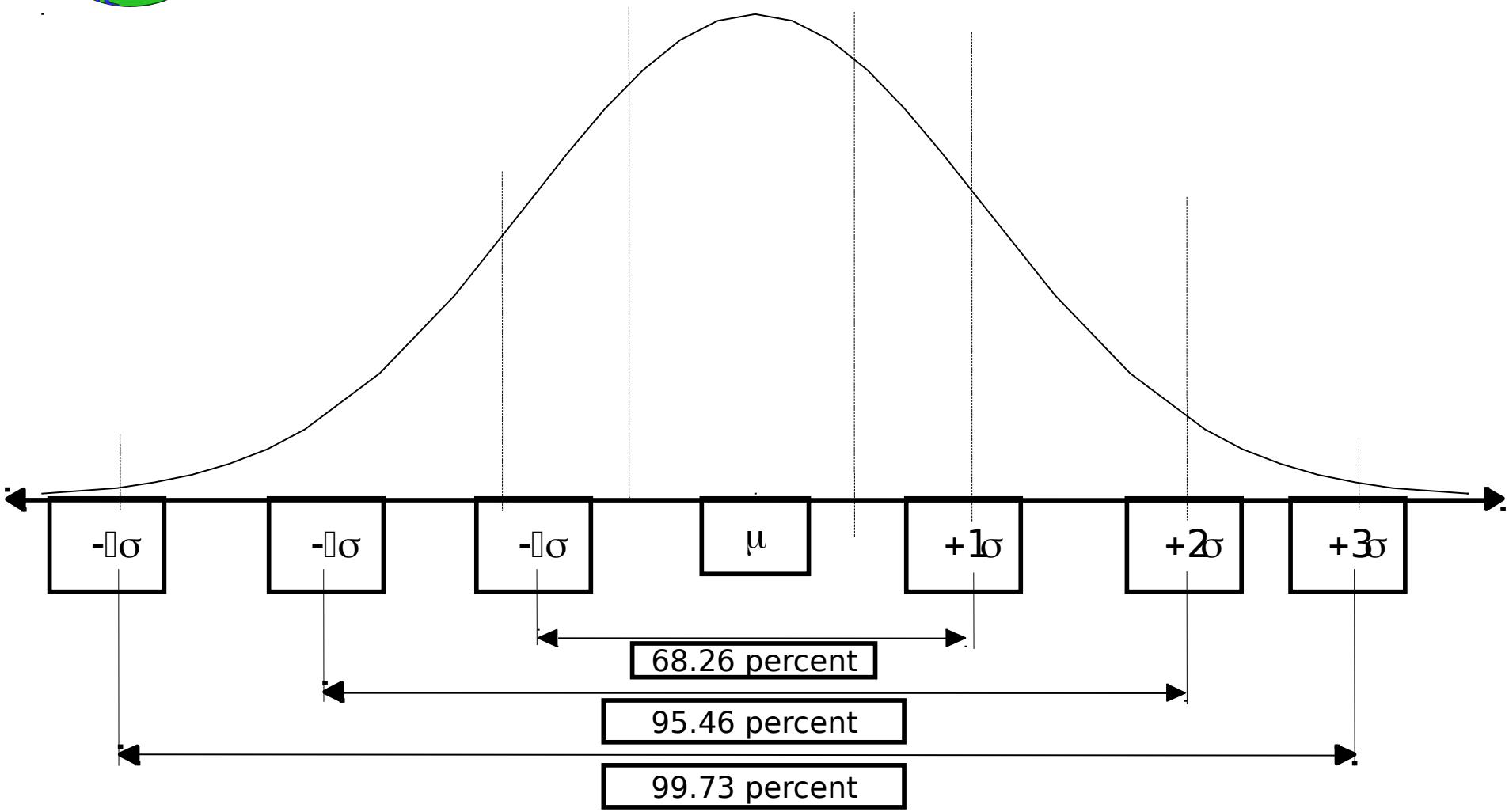
Customer Service: measure the number of calls answered on the first ring.

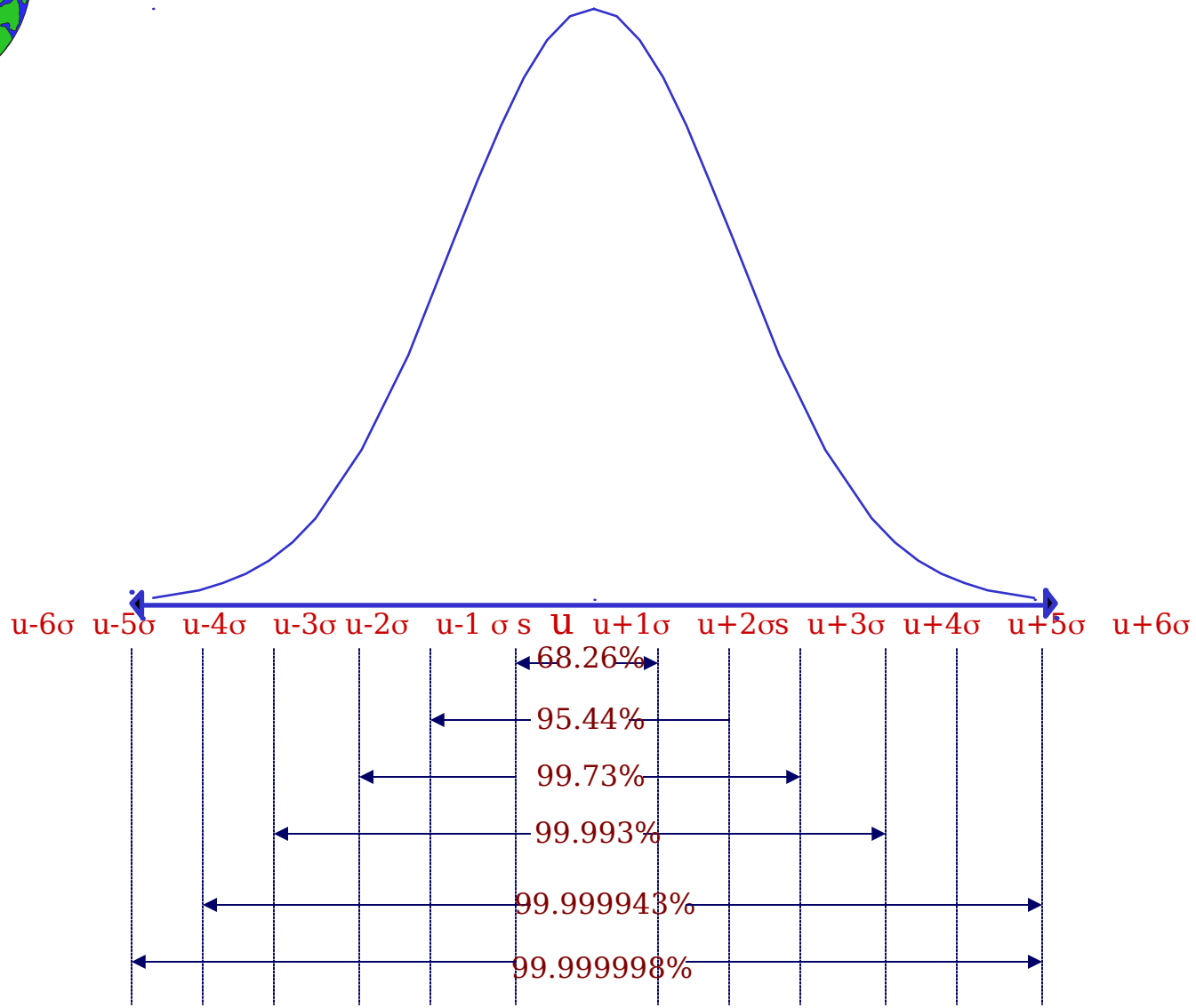
Engineering Support: reduce the number of schematics returned because of drafting errors

Order Fulfillment: eliminate Customer returns because of incorrect parts or product being shipped.

Finance: reduce the instances of accounts being paid after a specified time limit has elapsed.

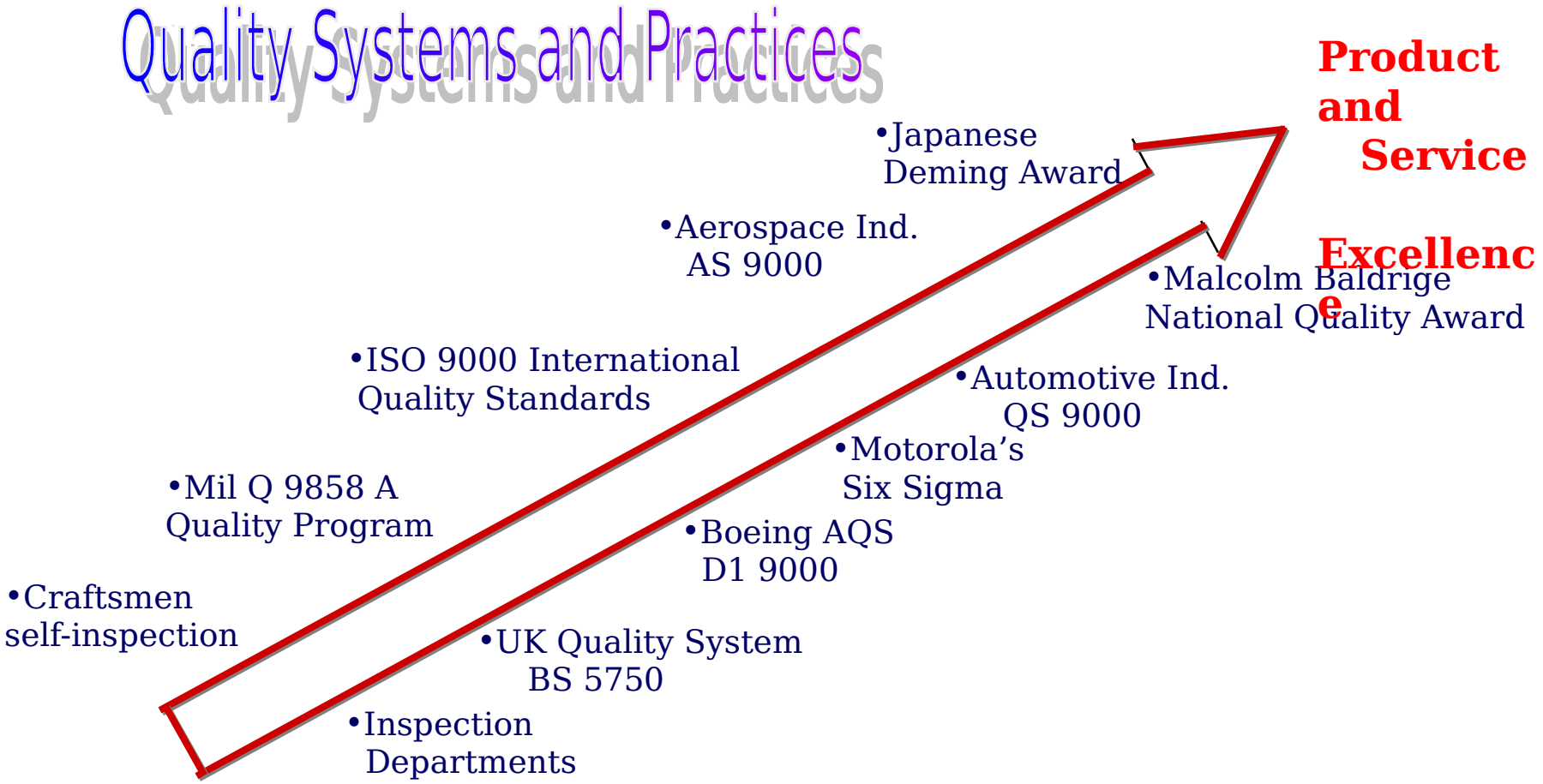
"NORMAL" DISTRIBUTION CURVE




u-6σ u-5σ u-4σ u-3σ u-2σ u-1 σ s u u+1σ u+2σs u+3σ u+4σ u+5σ u+6σ
68.26%
95.44%
99.73%
99.993%
99.999943%
99.999998%

ADVANCED PRACTICES AND SYSTEMS

Quality Systems and Practices



Advanced Practices in Design and Development, and Manufacturing

- IPPD/IPT
- Quality Function Deployment (QFD)
- Robust Design
- Design of Experiments (DOE)
- Failure Mode and Effects Analysis(FMEA)
- Design for Manufacturing and Assembly (DFMA)
- Loss Function
- Key Characteristics
- Measurement System Analysis
- Variability Reduction
- Statistical Process Control
- Process Capability
- Lean Manufacturing
- Cost of Quality
- Geometric Dimensioning and Tolerancing

SIX SIGMA AND BREAKTHROUGH STRATEGY

Tenets

- LEADERSHIP COMMITMENT
  - * Time
  - * Effort
  - * Resources
- MANAGING WITH DATA
  - * Design-measure-analyze-improve-control
- TRAINING AND CULTURAL CHANGES
  - * Integrated business strategy
  - * Impact on career paths

SIX SIGMA TRAINING AND APPLICATION

- Core and enabling processes
- Process 0wners
- Metrics
- Accelerated improvement cycle time

PROCESS TOOLS AND TECHNIQUES

- Reengineering
- Benchmarking
- Problem solving
- Team leader/facilitator
- Statistical tools